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| (21) International Application Number: PCT/US98/17824 (22) International Filing Date: 27 August 1998 (27.08.98) (30) Priority Data: 08/920,824 29 August 1997 (29.08.97) US | | (81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). | |
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| (54) Title: SINGLE PIN COAXIAL INITIATOR, RETAINER AND CONNECTOR AND METHOD OF OPERATION | | | |
| (57) Abstract <p>An initiator (10) positioned in a retainer (28) having a single pin (15) and an arcuate conductive ring shaped (29) and positioned so that the ring can be in conductive shunting contact with the pin or separated from the pin by a connector. The connector may be connected to the initiator or to the retainer.</p> | | | |
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WO 99/10954

PCT/US98/17824

SINGLE PIN COAXIAL INITIATOR, RETAINER
AND CONNECTOR AND METHOD OF OPERATIONBackground of the Invention

5 Present inflators for inflating vehicle air restraint members include an initiator with two pins (U.S. Patent Nos. 5,314,345 and 5,275,575). The two pins are located side by side and have an associated polarity. Some initiators are manufactured in such manner that one of the pins is visibly identifiable as the ground pin. Initiators are then placed
 10 10 in retainers that hold the initiator in the inflator and are placed in a specific orientation relative to the ground pin. The retainer must be aligned with the initiator ground pin.

15 Further, prior initiators include a shorting clip placed into the retainer for shunting the pins during shipping and handling. The clip provides an orientation feature for the electrical connector when assembled into a steering wheel, dashboard or elsewhere. The entire assembly must be oriented
 20 20 with the inflator mounting flange or retainer to provide specific orientation of the connector when mounted into the airbag module.

Summary of the Invention

25 Broadly, the present invention comprises an initiator connectable with an inflator retainer and an inflator connector. The initiator has preferably two arcuate electrical elements and the retainer has an arcuate first mechanical attachment element. The connector has (1) a
 30 30 second mechanical attachment element for mating engagement with the first attachment element of the retainer and the connector further has (2) arcuate electrical elements for mating with the arcuate electrical elements of the initiator.

After the initiator and the retainer are connected
 35 35 together, the connector is mechanically and electrically connected to the initiator-retainer unit by arcuate connecting elements. The use of such arcuate connecting

WO 99/10954

PCT/US98/17824

elements allows the connector to be connected to the initiator-retainer unit in any radial orientation.

Alternatively, the connector may be connected to the 5 initiator.

Brief Description of the Drawings

Fig. 1 is an elevational sectional view of the initiator of the present invention;

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Fig. 2 is a sectional view along line 2-2 of Fig. 1;

Fig. 3 is an elevational sectional view of the initiator positioned in and secured to a retainer;

15

Fig. 4 is an elevational sectional view of the initiator, retainer and connector;

Fig. 5 is a sectional view along line 5-5 of Fig. 4;

20

Fig. 6 shows an alternative connector;

Fig. 7 is a bottom view of the initiator-retainer- connector combination of Fig. 6;

25

Fig. 8 is a perspective view of the initiator of the present invention;

Fig. 9 is a perspective view of the conductive ring and 30 its arms;

Fig. 10 is an elevational sectional view of another initiator embodiment adapted so that the connector is connectable to the initiator; and

35

Fig. 11 is a view similar to Fig. 10 with the connector and initiator connected.

WO 99/10954

PCT/US98/17824

Description of the Preferred Embodiments

In Figs. 1, 8 and 9, initiator 10 includes header 12, including an outer nonconductive portion 12a and an inner conductive portion 12b with the lower header portion 12b forming collar 14. Initiator 10 further includes pin 15 and a conductive ring 17 with spring-loaded arms 19a, b with inner arcuate surfaces 20a, 20b and outer arcuate surfaces 21a, b. While two (2) arms are preferred one arm may be used or three or more arms. Cylindrical pin 15 is positioned in header portion 12b central opening 13 and surrounded by glass seal 26. Also shown are bridgewire 22, cups 24, 25 containing pyrotechnic material (not shown).

Turning to Fig. 3, initiator 10 is mounted in inflator 15 retainer 28 and held by crimped retainer ring 29 against gaskets 32. Retainer 28 may be separate or an integral part of the inflator (not shown). Retainer 28 includes a lower opening 30 surrounding the lower end 15a of pin 15. The lowest portion of opening 30 is defined by angled retainer 20 ring 28r having ring stop surface 28s.

With respect to Figs. 4 and 5, connector 34 is positioned in retainer opening 30 for mechanical engagement with retainer 28 and electrical engagement with initiator 10. 25 Connector 34 includes body portion 36 having deformable ring 38 for snap-engaging lower retainer ring 28r. Ledge 40 snaps over ring 28r during engagement. Connector 34 also has a central cylindrical core nonconductive portion 42 comprising inner nonconductive cylindrical socket piece 42a and outer 30 cylindrical mount piece 42b upon which is mounted arcuate electrical terminal contact element 44 which engage the outside surfaces 21a, b of arms 19a, b. Socket piece 42a with tapered end 42t functions to move arms 19a, 19b out of contact with pin 15. Further socket piece 42a carries 35 cylindrical terminal 48 for electrical connection to pin 15. Terminal 44 is mounted on mount piece 42b.

WO 99/10954

PCT/US98/17824

Fig. 6 illustrates an alternative connector 34' in which arcuate contact pieces 44', 48' contact the inside surface 20a, b of arms 19a, b. In Fig. 7 it is seen that connector 34' can be turned in any radial direction shown by arrow A 5 after mechanical connection to retainer 28 and electrical connection to initiator 10. The reason such turning can be accomplished is that the mechanical connection is between (1) a round, partially round or arcuate ledge 40 of ring 38 and (2) a round, partially round or arcuate ring 28r. Likewise, 10 the electrical connections are between cylindrical (arcuate) pin 15; cylindrical (arcuate) terminal 48'; round, partially round terminal 44' and arcuate arm surfaces 20a, b or 21a, b (Fig. 6). Connector 34' is free to turn against small frictional resistance of such the mechanical and electrical 15 engagements. Since connector 34' is capable of such rotation, connector 34' may be connected to retainer 28 in any radial circulation. Connector 34 of Fig. 4 is similarly rotatable and connectable in any radial orientation.

20 Turning to Figs. 10 and 11, a further embodiment is shown in which the outer nonconductive header portion 12a" has a circumferential groove 47 for receiving in snap engagement connector 34" which is similar in construction to the connector 34 of Fig. 4. Connector 34" has cylindrical 25 deformable body portion 53 having at its upper end a cylindrical projection rib 51.

In the operation of the initiator 10, retainer 28 and connector 34, 34' or 34", initiator 10 is inserted into 30 retainer 28 and ring 29 is crimped to urge component 10 against gaskets 32. Next, connector 34, 34' or 34" is placed in any radial orientation and snap fitted into retainer 28 or initiator 10 providing a mechanical connection to retainer 28 or initiator 10 and accomplishing an electrical connection.

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WO 99/10954

PCT/US98/17824

WE CLAIM:

1. An initiator for an inflator comprising
 - 5 a) a header including a charge and an electrical initiating element capable of initiating such charge;
 - b) a single electrically conductive pin connected to the electrical initiating element;
 - 10 c) an arcuate element mounted on the header surrounding such pin and connected to the electrical initiating element;
 - d) at least one spring-loaded arm connected to such arcuate element and in shunting engagement with such pin

whereby the initiator is protected against inadvertent firing
20 when such arm is in shunting engagement with such pin.

2. The initiator of claim 1 mounted in a retainer of an inflator.

- 25 3. The initiator and retainer combination of claim 2 having in addition a connector mechanically connected to the retainer and electrically connected to said initiator including electrical connection means for connecting to the initiator pin and the initiator arcuate element.

- 30 4. The initiator, retainer and connector combination of claim 3 in which the

- 35 (a) connector has a first arcuate mechanical attachment means and has two (2) first arcuate electrical attachment means;

WO 99/10954

PCT/US98/17824

(b) retainer has a second mechanical arcuate attachment means on the connector which is engageable with the first arcuate mechanical attachment means in any radial orientation;
5 and

(c) initiator has two (2) second arcuate electrical elements mateable with the electrical elements of the connector

10 whereby the first and second mechanical arcuate attachment means and the first and second arcuate electrical elements are frictionally and rotationally engageable with one another permitting the connector to be rotated relative to the
15 retainer and initiator.

5. The initiator, retainer and connector combination of claim 4 in which the connector includes a pin and arms and

20 (a) a nonconductive element for separating the at least one spring-loaded arm from engagement with said pin;

25 (b) first arcuate electrical attachment means is electrically engaged with the pin; and

(c) one first arcuate electrically attached means is electrically engaged with the arms.

30 6. The initiator of claim 1 in which the initiator and connector are connected together.

7. A method of configuring and connecting a connector, initiator and retainer comprising

35 (a) providing first arcuate attachment means on the retainer and second arcuate attachment

WO 99/10954

PCT/US98/17824

means compatible with the first attachment
means on the connector so that said attachment
means are rotatable with respect to one
another when attached; and

5

(b) providing first arcuate electrical engagement
means on the initiator and second arcuate
electrical engagement means on the connector
so that said first and second attachment means
are rotatable with respect to one another when
engaged.

10

8. A method of connecting a connector, an initiator
and a retainer comprising

15

a) providing on the initiator a conductive pin
and a spring biased arcuate element
surrounding the pin in engagement with the pin
as biased;

20

b) providing on the retainer a first arcuate
engagement means and on the connector a second
arcuate engagement means where engagement of
such engagement means permits relative
rotation therebetween; and

25

c) providing nonconductive circular insertion
means on the connector for insertion between
the pin and the pin spring biased arcuate
element

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whereby the connector is mechanically connectable to the
retainer and the connector is electrically connected to the
initiator in any radial orientation.

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WO 99/10954

PCT/US98/17824

9. The method of claim 8 in which the initiator includes engagement means and the connector second arcuate engagement means engages with the initiator engagement means.

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WO 99/10954

PCT/US98/17824

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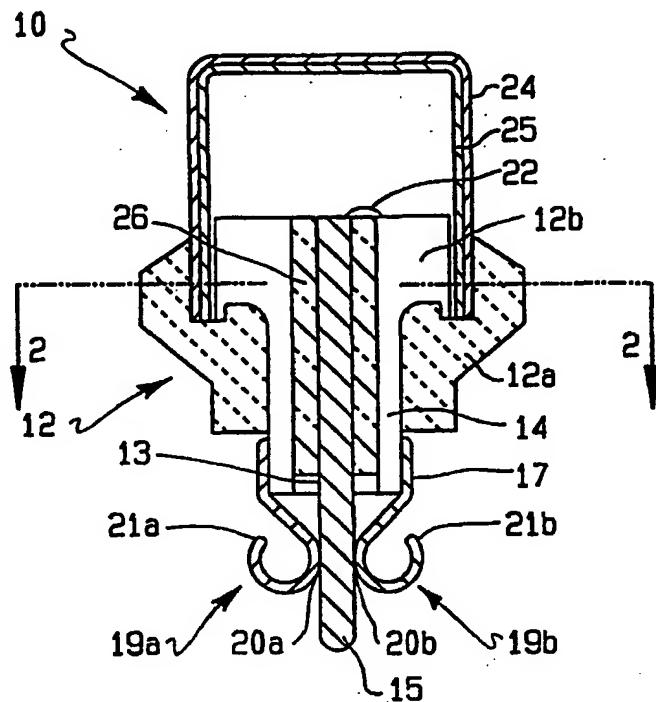


FIG. 1

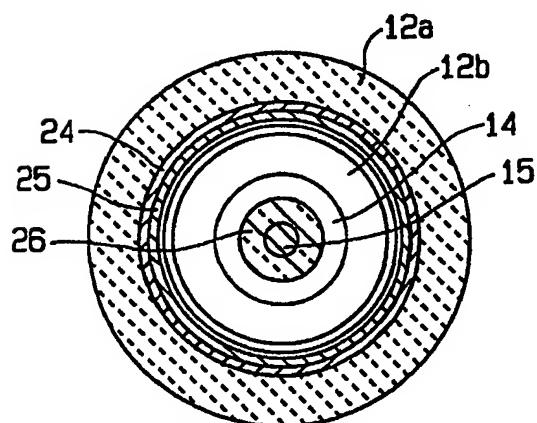


FIG. 2

WO 99/10954

PCT/US98/17824

2/6

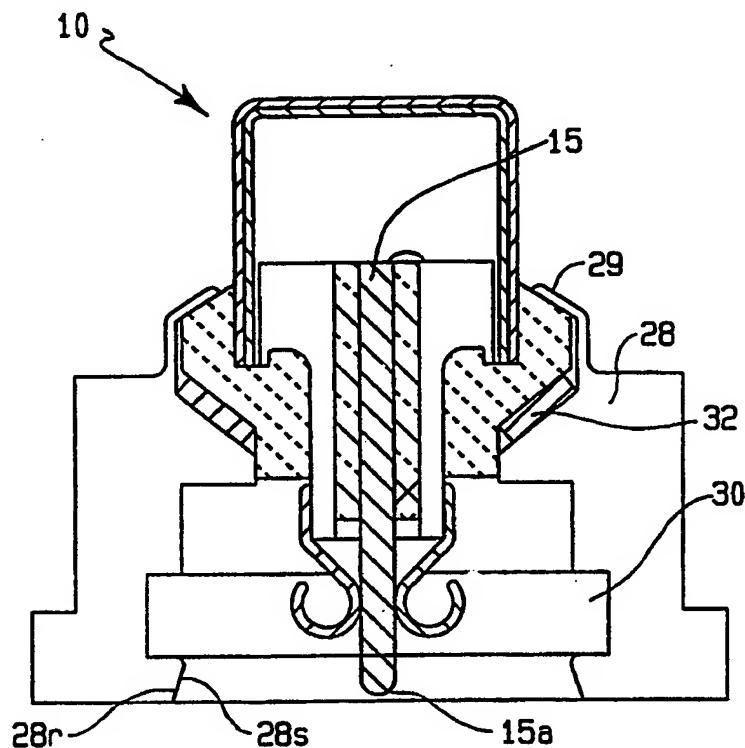


FIG. 3

WO 99/10954

PCT/US98/17824

3/6

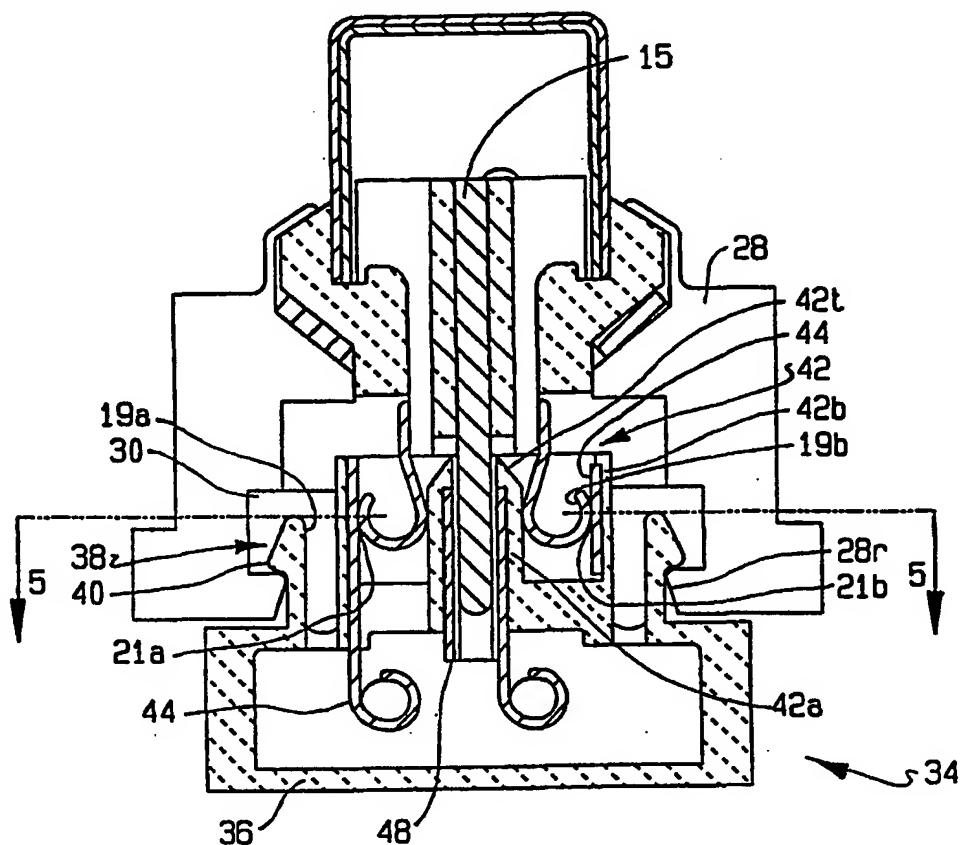


FIG. 4

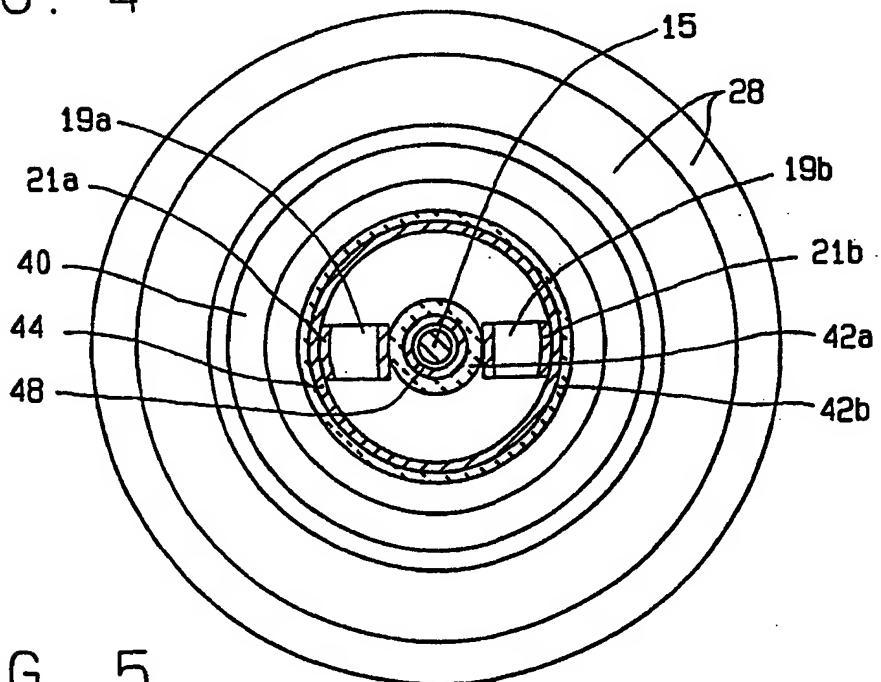


FIG. 5

SUBSTITUTE SHEET (RULE 26)

WO 99/10954

PCT/US98/17824

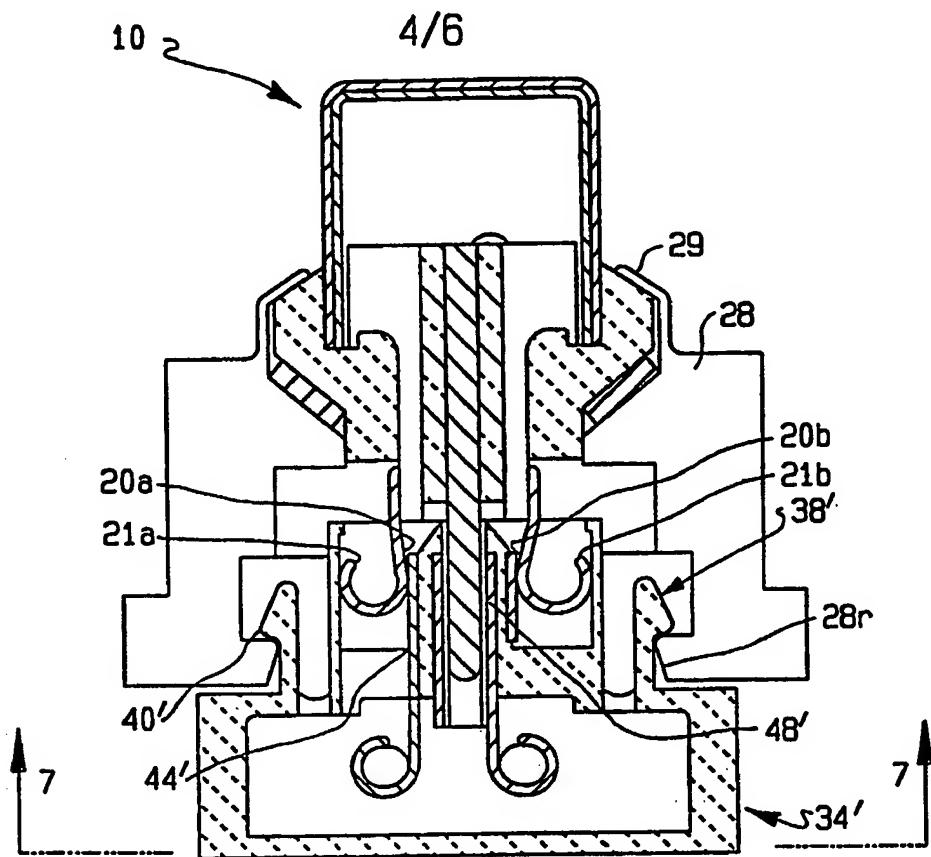


FIG. 6

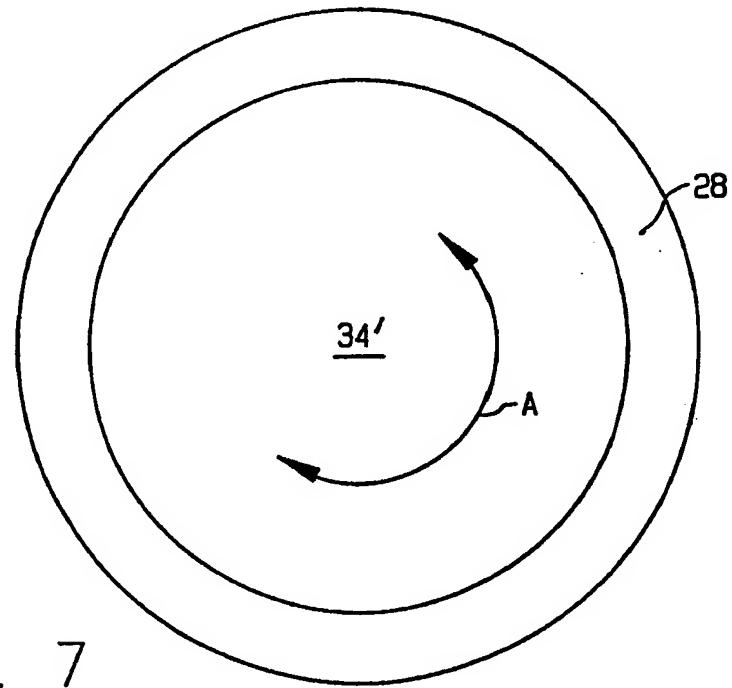


FIG. 7

SUBSTITUTE SHEET (RULE 26)

WO 99/10954

PCT/US98/17824

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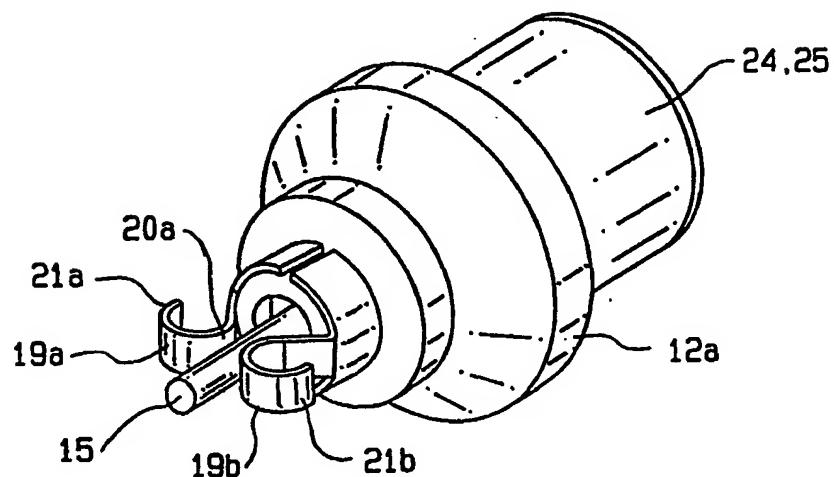


FIG. 8

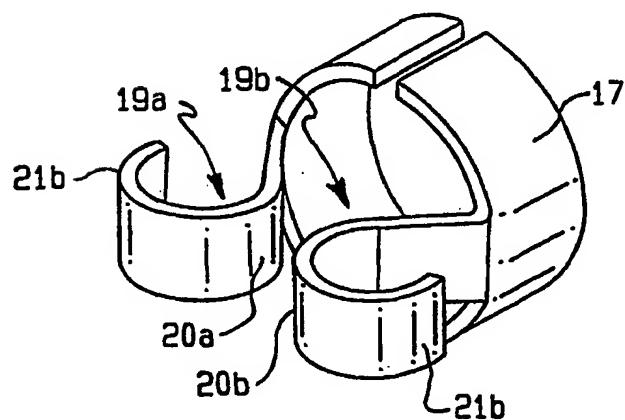


FIG. 9

WO 99/10954

PCT/US98/17824

6/6

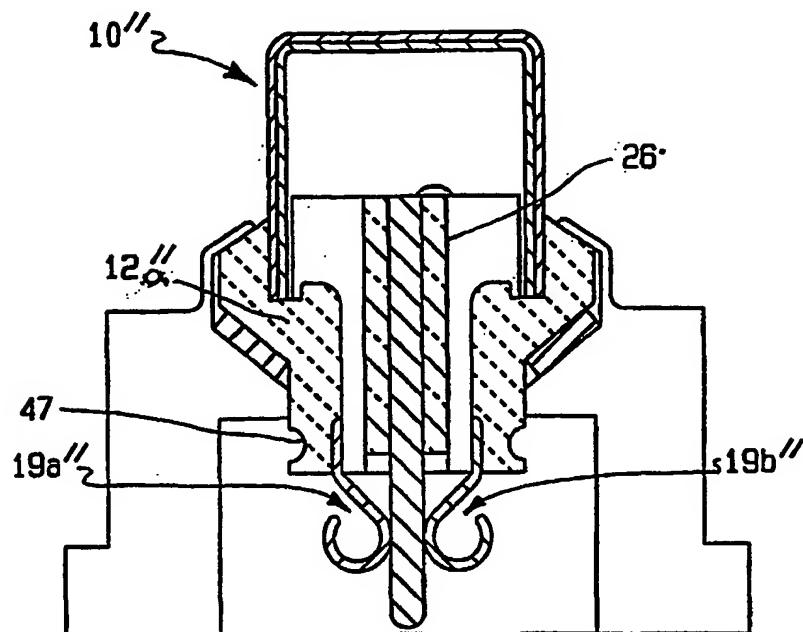


FIG. 10

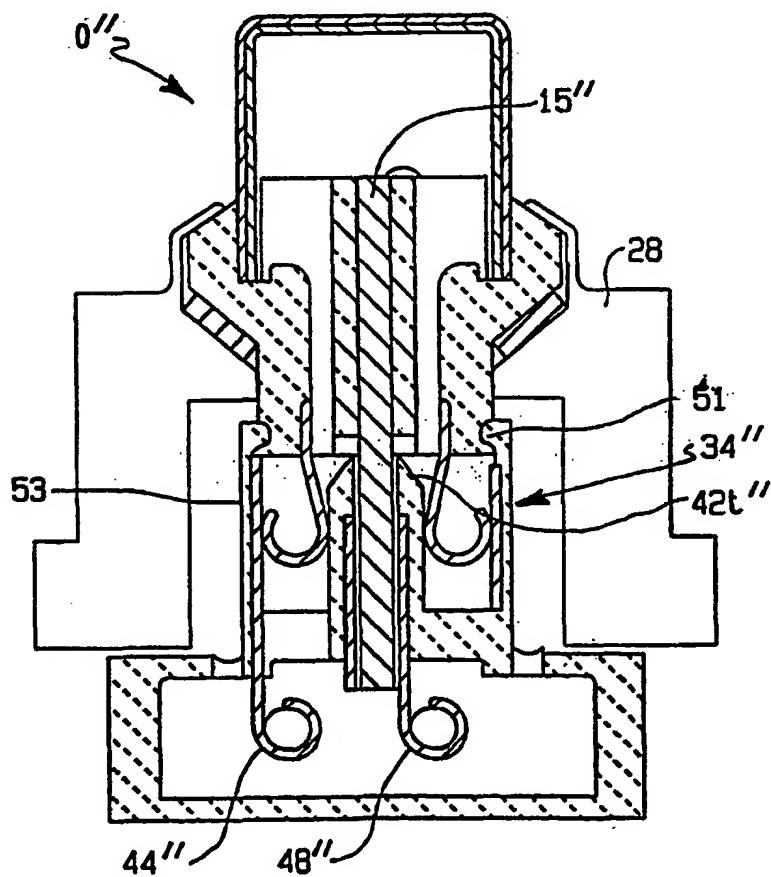


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/17824

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : HO1R 29/00

US CL : 439/188

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : Please See Extra Sheet.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| X,P | US 5,733,135 A (KENNEDY et al.) 31 March 98, (31/03/98) See figures 3-5. | 1-3, 6 |
| Y | US 3,847,463 A (HAYWARD et al.) 12 November 1974, (12/11/74) see figures 3 and 4 | 4,5,7-9 |
| A | US 5,621,183 A (BAILEY) 15 April 1997, (15/04/97) see figures 2-4 | 1-9 |

 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of mailing of the international search report

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B. FIELDS SEARCHED

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102/202.2,202.9,530
280/737,741